

Durability Evaluation of Cement Board produced from Untreated and Pre-treated Empty Fruit Bunch Fibre through Accelerating Ageing

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Abstract. Durability issue known that natural fibre tends to degrades in cementitious matrix particularly when in hot and humid exposure for a period of time. This experimental approach evaluates the potential of EFB cement board's durability in accelerated ageing condition. Initially, the EFB fibres are pre-treated for 24 hours by being soaked in 1% NaOH solution and oven-dried at $103\pm 2^\circ\text{C}$. Cement boards of 1300 kg/m^3 density are fabricated in the laboratory, with 2.5:1:2 ratio of ordinary Portland cement, EFB fibre and water with 3% CaCl_2 . Accelerated ageing assessment of hot water immersion for 10 days, 30 days and 60 days also wet dry cycle for 5 cycle, 15 cycle and 30 cycle at 70°C temperature are then conducted. The tested samples reveal finding ranges in modulus of rupture (MOR) of 3.98 – 9.11 MPa; modulus of elasticity (MOE) of 1056 – 4699 MPa; internal bonding (IB) of 0.28 – 0.53 MPa and thickness swelling (TS) of 1.66 – 9.25%. In addition, the field emission scanning electron microscope (FESEM) showed degradation mechanism of EFB cement board of before and after the accelerated ageing assessment. Conclusively, the findings showed that, accelerated ageing approach for durability assessment of cement boards could be done in quantifying the durability of samples in shorter time.

1. Introduction

It is generally known that most countries cultivated oil palm as a major plantation and in Malaysia, oil palms are the country's largest and most valuable crops thus further developments for a long-term strategy are needed for its potential as a material in structural and non-structural applications [1–5]. The natural fibre composite is known as more cost-effective, material with low energy consumption, environmentally friendly and sustainable [6, 7]. On top of that, it is important to take into account the adaptation of biodegradable composites, not simply for costs and availability but also for the consideration of occupants' health factor in the long-term service of the building [8,9,10]. Substantially, various research and development activities globally as well as in Malaysia, are looking towards discovering an alternative source and an innovatively reliable raw material from natural fibres and the oil palm empty fruit bunch fibre (EFB) is a fascinating discovery in Malaysia to specifically explore its durability potential as a composite material [11]. However when exposed to various ageing condition, the fibre itself experiences severe degradation in the cement matrix thus causing premature deterioration to the cement composite material [12, 13]. Amongst such climate factors as temperature, humidity, solar radiation, precipitation as well as pollutants throughout the year; both high temperature

